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4. (Twice amended) The process of Claim 3, wherein the zeolite has an initial silica/alumina molar ratio ranging from about 5 to about 30.

REMARKS

Applicants respectfully request entry of the above amendment and reconsideration of this application as presently amended.

Claim 1 has been amended by introducing therein the limitation of claim 4 which itself is now amended to cover the use of a catalyst whose zeolite has a "relatively high" initial silica/alumina molar ratio ranging between 5 and 30, support for which can be found in the specification at page 8, lines 29 to 32.

Claims 1-10 are presently in the application.

The present invention relates to a process for converting C_4+ naphtha hydrocarbon feed over a catalyst comprising ZSM-5, ZSM-11 or combinations thereof treated with phosphorus-containing compound, and a substantially inert matrix material, the catalyst containing less than 20 wt% of active matrix material and having an initial silica/alumina molar ratio of less than about 70. The contacting is carried out under conditions sufficient to produce a product containing light olefins and aromatics.

The process can be used to provide increased yields of ethylene, propylene and high quality motor fuels containing aromatics from low value refinery, petrochemical or other chemical synthesis streams or other naphtha streams, especially in catalytic cracking reactors, e.g., conventional FCC units which ordinarily employ heavier feeds such as deep cut gas oil, vacuum gas oil, thermal oil, residual oil, cycle stock, whole top crude, and the like. A key element of the present invention is its use of a catalyst comprising a zeolite which zeolite itself has been modified by treatment with a phosphorus compound, combined with a substantially inert matrix material. The catalyst comprises a zeolite component that is necessarily treated with a phosphorus compound.

Rejection Under 35 U.S.C. § 102(b)

Claims 1-10 have been rejected under 35 U.S.C. § 102(b) as being anticipated by EP 0323736.

EP 0323736 is cited as disclosing a process for converting C₅-C₁₀ paraffinic hydrocarbons into aromatic hydrocarbons and light olefins, wherein the feed can be a coker gasoline, light FCC gasoline, C₅-C₇ fractions of straight run naphthas and pyrolysis gasoline. The Examiner contends such feeds necessarily boil within the claimed ranges and that the process comprises contacting the feed with a catalyst comprising ZSM-5 or ZSM-11. The Examiner further urges that the reference discloses zeolite with silica to alumina ratio of 100 or less, which may be treated with a phosphorus compound, as well as including a binder material that may be an inactive material such as clay. Inasmuch as the reference does not teach active matrix is required, the Examiner argues that the catalyst contains less than 20 wt.% of active matrix. The Examiner also concludes that the same feed over the same catalyst would inherently provide the same product components required by the present claims.

This rejection is respectfully traversed.

EP 0323736 teaches using *low* acidity catalyst having an alpha value of 5 to 25. The reference catalyst may comprise zeolite blended with "sufficient amounts of binder material" (page 5, lines 13-15). The reference is silent concerning phosphorus treatment of the catalyst except for teaching at page 3, lines 46-49 the use of zeolites which

can be free of oxides incorporated into the zeolites by an impregnation treatment. Thus, these zeolites can be free of oxides incorporated into the zeolites by an impregnation treatment. Examples of such impregnated oxides include oxides of phosphorus as well as those oxides of the metals of Groups IA, IIA, IIIA, IVA, VA, VIA, VIIA, VIIIA, IB, IIB, IIIB, IVB, or VB of the Periodic Chart.

Thus the reference does not positively recite introducing phosphorus, but rather teaches that zeolites which have not been phosphorus impregnated are suitable for use.

Moreover, the claims as presently amended require a catalyst whose zeolite has an initial silica to alumina molar ratio of less than 70. The reference, while teaching silica to alumina molar ratio of 100 or less, fails to specifically disclose catalysts having silica to alumina molar ratio below 100, much less the present range of less than about 70 or the preferred range of 5 to 30 now set out in claim 4. The reference also teaches away from the present invention by specifically teaching the use of zeolites "which are intrinsically less active by virtue of having a high silica to alumina molar ratio of, e.g., greater than 100" (page 5, lines 26 and 27). Accordingly, it is respectfully submitted that one skilled in the art acquainted with the EP reference would not find it obvious to arrive at the invention as presently claimed. In view of this, withdrawal of this rejection is respectfully requested.

Rejection Under 35 USC 102(a)

The Examiner has rejected claims 1-3, 5 and 7-10 under 35 USC 102(a) as being anticipated by U.S. Patent No. 5,898,089 to Drake et al. (Drake). Drake is cited as disclosing a process for converting a C₄+ naphtha hydrocarbon feed to make light olefins such as ethylene and propylene, as well as aromatics. The Examiner contends such feeds necessarily boil within the claimed ranges and that the process comprises contacting the feed with a catalyst comprising ZSM-5 or ZSM-11 treated with coke-suppressing amounts of phosphorus, within the claimed operating conditions, including the use of a diluent such as steam. The Examiner further urges that the reference discloses use of a clay inert matrix material and does not require the presence of active matrix material. Products of the reference according to the Examiner should inherently be within the presently claimed ranges of claims 7, 9 and 10 inasmuch as "the process of Drake converts the same feeds as claimed with the same catalyst as claimed."

The Examiner acknowledges that the reference does not disclose all the conversion conditions and does not disclose that the zeolite has an initial silica/alumina ratio less than about 70. Nevertheless, the Examiner maintains it would be obvious to one skilled in the art to modify Drake's process by using a

catalyst/hydrocarbon feed weight ratio or a catalyst of silica/alumina molar ratio within the claimed ranges because one would utilize any ratio that effectively converts hydrocarbon to the desired products.

This rejection is respectfully traversed.

Drake discloses using a catalyst comprising acid-treated zeolite, such as ZSM-5, to process fluid C₄-C₃₀ hydrocarbon feed, such as gasolines from cracking processes and naphthas (col. 9, lines 39-46) to convert hydrocarbons to C₆-C₈ aromatic hydrocarbons and olefins. The catalyst is promoted with a wide variety of compounds including phosphorus-containing compounds that can be converted to phosphorus oxide for "reducing coke deposition." The reference is silent concerning use of "substantially inert matrix material" as required by the present application" and teaches an active matrix material, alumina, as preferred binder (column 3, lines 17-18), although the reference also teaches the presence of clay in the catalyst.

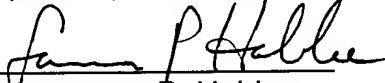
Drake is also completely silent concerning the silica to alumina molar ratio of its catalyst. There is no suggestion or disclosure that the catalyst should contain the "relatively high silica zeolites" having an initial silica/alumina molar ratio of not greater than 70, or preferably above 5 and less than 30 (claim 4) which the present invention requires (see, specification at page 8, lines 30 to 32). It is respectfully submitted that given Drake's teachings, one skilled in the art would lack any incentive to employ the silica/alumina molar ratios in the zeolites employed in the present process.

Accordingly, it is respectfully submitted that the present claims meet the requirements of 35 USC 102(a) and withdrawal of the rejection thereunder is therefore requested.

CONCLUSION

Applicants respectfully submit that the foregoing arguments obviate all of the outstanding rejections in this case and place the application in condition for immediate allowance. Allowance of this application is therefore earnestly solicited.

Respectfully submitted,

By 
Laurence P. Hobbes
Reg. No. 29,651
Attorney for Applicants
(703) 934-7008

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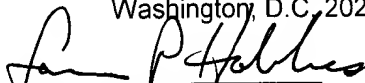
Laurence P. Hobbes
Roberts, Mlotkowski, & Hobbes, P.C.
3911 Old Lee Highway Suite 43 B
Fairfax, Virginia 22030

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Laurence P. Hobbes

VERSION WITH MARKINGS TO SHOW CHANGES MADE IN THE CLAIMS:

The following changes are being made to claims 1 and 4:

1.(Three times amended) A process for converting a C₄+ naphtha hydrocarbon feed to a product which includes light olefins and aromatics, comprising:

contacting said feed with a catalyst comprising ZSM-5, ZSM-11 or combinations thereof treated with a phosphorus-containing compound, and a substantially inert matrix material, wherein said catalyst contains less than 20 wt% of active matrix material and has an initial silica/alumina molar ratio less than about 70, said contacting being effected under conditions to produce a product containing light olefins and aromatics.

4. (Twice amended) The process of Claim 3, wherein the zeolite has an initial silica/alumina molar ratio [less than] ranging from about 5 to about 30.